

## **DETAILED ACTION**

### ***Response to Amendment***

1. The Examiner acknowledges that no claim has been amended. Claims 1-17 are currently pending.

### ***Response to Arguments***

2. Applicant's arguments, see remarks, filed 02/19/10, with respect to the rejection(s) of claim(s) 1-12 and 14-17 under 35 U.S.C. 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of a newly found prior art reference.

### ***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-5, 12 and 16 are rejected under 35 U.S.C. 102(b) as being anticipated by Kafka et al (US Patent 5,212,698) ("Kafka").

5. Regarding claim 1, Kafka discloses laser system (10, fig. 4a) according to the principle of the regenerative amplifier, comprising: an amplifying laser medium (12, fig. 4a, col. 3 lines 2-3), a laser resonator (formed by output coupler 20 and GTI 22, fig. 4a, col. 3 lines 15-20) having at least one resonator mirror (GTI 22, fig. 4a, col. 3 lines 19-20) and at least one modulator (24, fig. 4a, col. 3 lines 23-37), and a pump source (18,

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fig. 4a, col. 3 lines 12-15) for pumping the laser medium, wherein the laser resonator is designed to operate with a repetition rate of greater than 50kHz ("repetition rate of 82 MHz," col. 9 lines 15-17) and has a pulse stretcher (prisms 64, 66, 68 and 70 made of SF10 glass, fig. 4a, col. 6 lines 17-21 and 40-44), inside a cavity of the resonator (see fig. 4a), as a specially designed component, the pulse stretcher having at least one of a structure- or material-related dispersive effect, the pulse stretcher having a minimum 3rd order dispersion with a maximum 2nd order dispersion (inherent property of SF10 glass, col. 6 lines 17-21).

6. Regarding claim 2, Kafka discloses wherein the pulse stretcher has a block of highly dispersive material (SF10 glass, col. 6 lines 17-21).

7. Regarding claim 3, Kafka discloses wherein multiple reflections takes place within the block by reflections at interfaces (multiple reflections take place within prisms 64, 66, 68 and 70, fig. 4a).

8. Regarding claim 4, Kafka discloses wherein the pulse stretcher has a Gires-Tournois interferometer (22, fig. 4a, col. 3 line 66 - col. 4 line 4 and col. 7 lines 20-28).

9. Regarding claim 5, Kafka discloses wherein the pulse stretcher (GTI 22, fig. 2a) has at least two reflecting surfaces (30 and 32, fig. 2a, col. 4 lines 14-20), the surfaces being arranged in such a way that the surfaces are oriented -relative to one another (see fig. 2a) and - at an opening angle (see fig. 2a) and the laser beam is reflected at least twice at at least one of the surfaces (laser beam is reflected at least twice at reflective surface 30 or 32, fig. 2a).

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10. Regarding claim 12, Kafka discloses wherein the highly dispersive material is SF10 glass (col. 6 lines 17-21).

11. Regarding claim 16, Kafka discloses wherein the dispersive layer structure is used as a folding mirror (GTI 22 is used as a folding mirror, see fig. 4a).

***Claim Rejections - 35 USC § 103***

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

14. Claims 6-8 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kafka et al in view of Perry et al (US Patent 6,150,630) ("Perry").

15. Regarding claims 6 and 14, Kafka has disclosed the laser system outlined in the rejection of claim 1 above. In particular, Kafka discloses the laser medium 12 is a Ti:Sapphire gain medium. Kafka fails to disclose wherein the laser medium has an inversion life time greater than 1 ms, or wherein the laser medium is a Yb:glass or a Yb:crystal. Perry discloses a similar laser system comprising a regenerative amplifier

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(56, fig. 4) that utilizes a Titanium-doped sapphire (58, fig. 4, col. 5 lines 45-47) as the gain medium. Perry further discloses that any laser material with sufficient bandwidth to support the bandwidth of the short pulse may be used, such as a Yb-doped glass (col. 5 lines 47-53) which has an inversion life time greater than 1 ms (inherent property of Yb-doped glass). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use a Yb:glass as the gain medium, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416.

16. Regarding claim 7, Kafka has disclosed the laser system outlined in the rejection to claim 1 above, but fails to disclose wherein a femtosecond oscillator for inputting seed pulses, the femtosecond oscillator being formed and arranged in such a way that the seed pulses are femtosecond pulses or picosecond pulses on input into the laser resonator. Perry discloses a similar laser system comprising a femtosecond oscillator (40, fig. 4, col. 6 lines 57-60) for inputting seed pulses, the femtosecond oscillator being formed and arranged in such a way that the seed pulses are femtosecond pulses or picosecond pulses on input into the laser resonator (laser oscillator 40 produces 100 fsec pulses, col. 6 lines 57-60). It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the laser system of Kafka with the laser oscillator producing femtosecond seed pulses as taught by Perry in order to obtain fast and high power output pulses.

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17. Regarding claim 8, Kafka has disclosed the laser system outlined in the rejection to claim 1 above. In particular, Kafka discloses the modulator 24 is a standard acousto-optic modelocker. Kafka fails to disclose wherein an electro-optical switching element as a modulator. Perry discloses a similar regenerative amplifier (56, fig. 4) comprising an electro-optical switching element (Pockels cells 62 and 64, fig. 4, col. 7 lines 1-4) as modulator. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the laser system of Kafka with the electro-optic switching element as taught by Perry in order to reduce optical loss.

18. Claims 9, 10, 15 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kafka et al in view of Taiha Joo et al ("Ti:sapphire regenerative amplifier for ultrashort high-power multikilohertz pulses without an external stretcher," Feb. 15, Vol. 20, No. 4, Optics Letter, pp. 389-391) (IDS filed on 07/21/06) ("Joo").

19. Regarding claim 9, Kafka has disclosed the laser system outlined in the rejection to claim 1 above, but fails to disclose wherein a pulse compressor is outside the laser resonator. Joo discloses a similar laser system comprising a regenerative amplifier having a laser resonator, and a grating compressor (fig. 1) outside of the laser resonator. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the laser system of Kafka with the grating compressor outside of the laser resonator as taught by Joo in order to obtain high power output pulses.

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20. Regarding claims 10 and 15, Kafka, when modified by Joo, discloses wherein the pulse compressor has a dispersive grating having less than 1200 lines/mm (600 groove/mm, left column, p. 390, lines 41-47 of Joo).

21. Regarding claim 17, Kafka, when modified by Joo, discloses a relationship of the pulse compressor outside the laser resonator is according to a Treacy design (see fig. 1 of Joo).

22. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kafka et al in view of Aoshima et al (US Patent 5,815,519) ("Aoshima").

23. Regarding claim 11, Kafka has disclosed the laser system outlined in the rejection of claim 1 above. In particular, Kafka discloses the pump laser 18 is an all-lines argon ion laser for pumping the gain medium 12. Kafka fails to disclose the pump source is a laser diode. Aoshima discloses a similar laser system comprising an excitation source (400, fig. 1, col. 8 lines 49-51) including a LD (410, fig. 1, col. 9 lines 54-57) and a condensing lens (420, fig. 1, col. 9 lines 54-57) for supplying an excitation energy to the laser medium (100, fig. 1). It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the laser system of Kafka with the excitation source including a LD as taught by Aoshima in order to obtain a higher pump power to supply to the laser medium.

***Allowable Subject Matter***

24. Claim 13 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

25. The following is an examiner's statement of reasons for allowance: claim 13 is believed to be allowable over the cited prior art. Kafka discloses a similar laser system comprising a pulse stretcher as recited in claim 1. Kafka further discloses the pulse stretcher is a Gires-Tournois interferometer 22 including two reflective surfaces 30 and 32 at an open angle. However, Kafka fails to disclose the limitation of "wherein the opening angle is adjustable" because the open angle between the two reflective surfaces 30 and 32 of the GTI 22 is fixed.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to YUANDA ZHANG whose telephone number is (571)270-1439. The examiner can normally be reached on Monday-Friday, 9:00am-5:00pm EST.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Harvey can be reached on 571-272-1835. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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